Comprehensive Remedial Design/Remedial Action Work Plan for the Test Area North, Waste Area Group 1, Operable Unit 1-10, Group 2 Sites

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order* (FFA/CO) (Department of Energy Idaho Operations Office [DOE-ID] 1991) between the Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ), hereafter referred to as the Agencies, the DOE submits the following Comprehensive Remedial Design/Remedial Action Work Plan (RD/RA WP) for the Group 2 sites at Test Area North (TAN). Under the current remediation management strategy outlined in the FFA/CO, the location identified for the remedial action is designated as Waste Area Group (WAG) 1, Operable Unit (OU) 1-10 at the Idaho National Engineering and Environmental Laboratory (INEEL).

As part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.), the release sites at TAN OU 1-10 were evaluated through a comprehensive remedial investigation/feasibility study (RI/FS) (DOE-ID 1997). The RI/FS assessed the investigations previously conducted for WAG 1, thoroughly investigated the sites not previously evaluated, and determined the overall risk posed by the WAG. The OU 1-10 RI/FS culminated with the finalization of the OU 1-10 Record of Decision (ROD) (DOE-ID 1999). The ROD identified eight sites requiring remedial action and the specific remedies for each. To facilitate remediation, and as agreed to by the Agencies, the eight sites requiring remediation in WAG 1 are divided into three groups. The sites included in each group are presented in Table 1-1.

Table 1-1. WAG 1, OU 1-10 sites requiring remediation.

Group	Sites
Group 1	Soil Contamination Area south of the Turntable (Technical Support Facility [TSF]-06, Area B), Fuel Leak Site (Water Reactor Research Test Facility [WRRTF]-13), and PM-2A Tanks soil excavation (TSF-26)
Group 2	TSF Intermediate-Level (Radioactive) Waste Disposal System (TSF-09) and Contaminated Tank southeast of Tank V-3 (TSF-18)
Group 3	PM-2A Tanks tank contents removal (TSF-26) and the Burn Pits (WRRTF-01 and TSF-03)

The Group 2 sites are addressed in this RD/RA WP. The two sites, the TSF Intermediate-Level (Radioactive) Waste Disposal System (TSF-09) and the Contaminated Tank southeast of Tank V-3 (TSF-18), are of similar nature and location and are collectively referred to as the V-Tanks. Soil surrounding the tanks is contaminated from tank operations. The sites were evaluated together in the supporting documents in the RI/FS and ROD and were identified as requiring remediation, as releases from the sites pose imminent and substantial endangerment to human health and the environment.

The OU 1-10 ROD presents alternative remedies to be considered for the V-Tanks and the selected remedy to be conducted at the sites. Based upon CERCLA requirement considerations, detailed analysis of alternatives, and public comments, the Agencies' selected remedy presented in the ROD is soil and tank removal, ex situ treatment of tank contents, and disposal of removed materials. The selected remedy addresses the risks posed by the V-Tanks by effectively removing the source of contamination and breaking the pathway by which a future receptor may be exposed. The 2001 OU 1-10 Explanation of Significant Differences (ESD) (DOE-ID 2001a) adds additional detail regarding onsite ex situ treatment and waste storage.

Within the boundary of the Group 2 sites are non-CERCLA components managed under a Voluntary Consent Order (VCO) between the State of Idaho and the DOE to correct potential Hazardous Waste Management Act/Resource Conservation and Recovery Act (RCRA) noncompliance's (IDEQ 2000). These components will be removed as part of the Group 2 Remedial Action in accordance with the RCRA-regulated VCO.

1.1 Work Plan Organization

This Group 2 RD/RA WP presents the design and implementation strategy for the ROD-selected remedy. The following are brief descriptions of the work plan sections and appendices:

- Section 1, Introduction, describes the background and history of the Group 2 sites and gives an overview of the selected remedy implementation approach addressed in this RD/RA WP.
- Section 2, Design Basis, provides the remedial action objectives, remedy performance objectives, and design objectives to be achieved by this Group 2 RD/RA WP. Design codes, industrial standards, and INEEL and DOE requirements are also presented.
- Section 3, Uncertainty Management, identifies several project uncertainties and describes the project management approach for uncertainties that may be encountered during the remedial action.
- Section 4, Remedial Design, presents a summary of the design assumptions, criteria, technical design components, and quality assurance and safety category evaluations.
- Section 5, Environmental Compliance, lists the applicable or relevant and appropriate requirements (ARARs) and the compliance strategy to be implemented for each ARAR.
- Section 6, Remedial Action Work Plan, presents the necessary steps and documentation required to complete the remedial action. Remedial action work tasks, supporting documents, and inspections are presented in this section.
- Section 7, Changes to the Remedial Design/Remedial Action Scope of Work and Group 2 Remedial Design/Remedial Action Work Plan, discusses changes to the OU 1-10 Remedial Design/Remedial Action (RD/RA) Scope of Work (SOW) (DOE-ID 2000a) and the Group 2 RD/RA WP, and the creation of the Group 3 RD/RA WP.
- Section 8, Institutional Controls, Operations and Maintenance, and Five-Year Review, describes the necessary actions to occur after the remedial action has taken place.
- Section 9, References, is a list of referenced material.
- Appendix A, Design Drawings, contains drawings that illustrate the work to be performed during the remedial action.
- Appendix B, Design Specifications, contains the technical and engineering details of equipment, materials, and procedures to be used in the remediation.
- Appendix C, Design Calculations, provides the technical analysis of all components to be implemented in the effort. Dose rate calculations, transportation and packaging analyses, and engineering calculations are included in this appendix.

- Appendix D, Air Emissions Modeling and Data Output, presents a summary of the results of the air emissions evaluation to satisfy project ARARs.

- Appendix E, Safety Category Evaluation (formerly Quality Level Evaluation), presents the safety category designation for each component of the remedial action.

- Appendix F, Remedial Action Cost Estimate, provides an estimate of the total projected costs for implementing the remedial action.

- Appendix G, Tank V-9 Analytical Results and Analysis Report, presents the results from the 2001 Tank V-9 contents sampling and analysis.

- Appendix H, V-Tanks Characterization Sampling Data, presents the historical sampling data for the V-Tanks soil and tank contents.

- Appendix I, V-3 Overflow Prevention Plan, discusses the contingency plan should Tank V-3 approach overflow conditions before the remedial action is implemented.

- Appendix J, Agency Comment Resolution Forms, provides the comment resolution forms used to resolve the draft and draft final comments received from the Agencies on the RD/RA WP and associated documents.

1.2 Background

1.2.1 Area Background

The INEEL is a government-owned/contractor-operated facility managed by the DOE-ID (Figure 1-1), located 51 km (32 mi) west of Idaho Falls, Idaho. The INEEL occupies 2,305 km^2 (890 mi^2) of the northeastern portion of the Eastern Snake River Plain and encompasses portions of five Idaho counties: (1) Butte, (2) Jefferson, (3) Bonneville, (4) Clark, and (5) Bingham County. Test Area North is located at the northern end of the INEEL, approximately 96 km (60 mi) from Idaho Falls, Idaho. The facility was originally built between 1954 and 1961 to support the Aircraft Nuclear Propulsion Program sponsored by the U.S. Air Force and the Atomic Energy Commission. The program's objectives were to develop and test designs for nuclear-powered aircraft engines (DOE-ID 1997). Upon termination of this research in 1961, the area's facilities were converted to support a variety of other DOE research projects. From 1962 through 1986, the area supported reactor safety testing and behavior studies at the Loss-of-Fluid Test Facility. Beginning in 1980, TAN was used to conduct work with material from the 1979 Three Mile Island reactor accident (DOE-ID 1997). Current activities include the manufacture of armor for military vehicles at the Specific Manufacturing Capability Facility and nuclear inspection and storage operations at the TSF (DOE-ID 2000b). Decontamination and dismantlement of the Initial Engine Test Facility was completed in 2000.

1.2.2 Remedial Action Sites

The remediation sites addressed under this Group 2 RD/RA WP are located at TAN. TSF-09 and TSF-18 (the V-Tanks) are situated in an open area east of TAN-616 and north of TAN-607 (Figure 1-2). Soil contamination attributable to the V-Tanks surrounds these tanks. The area of contamination (AOC) defined by the contaminated soil is estimated at 15.2 m (50 ft) by 24.4 m (80 ft) (DOE-ID 1999). Several non-CERCLA components are located within the AOC (Figure 1-4), which may impede access to the V-Tanks, including the TAN-1704 valve pit and adjacent piping as indicated in the remedial design drawings (Appendix A, Sheet 7 of 20, Pipe Removal Plan). The valve pit is associated with the former V-Tank operations.

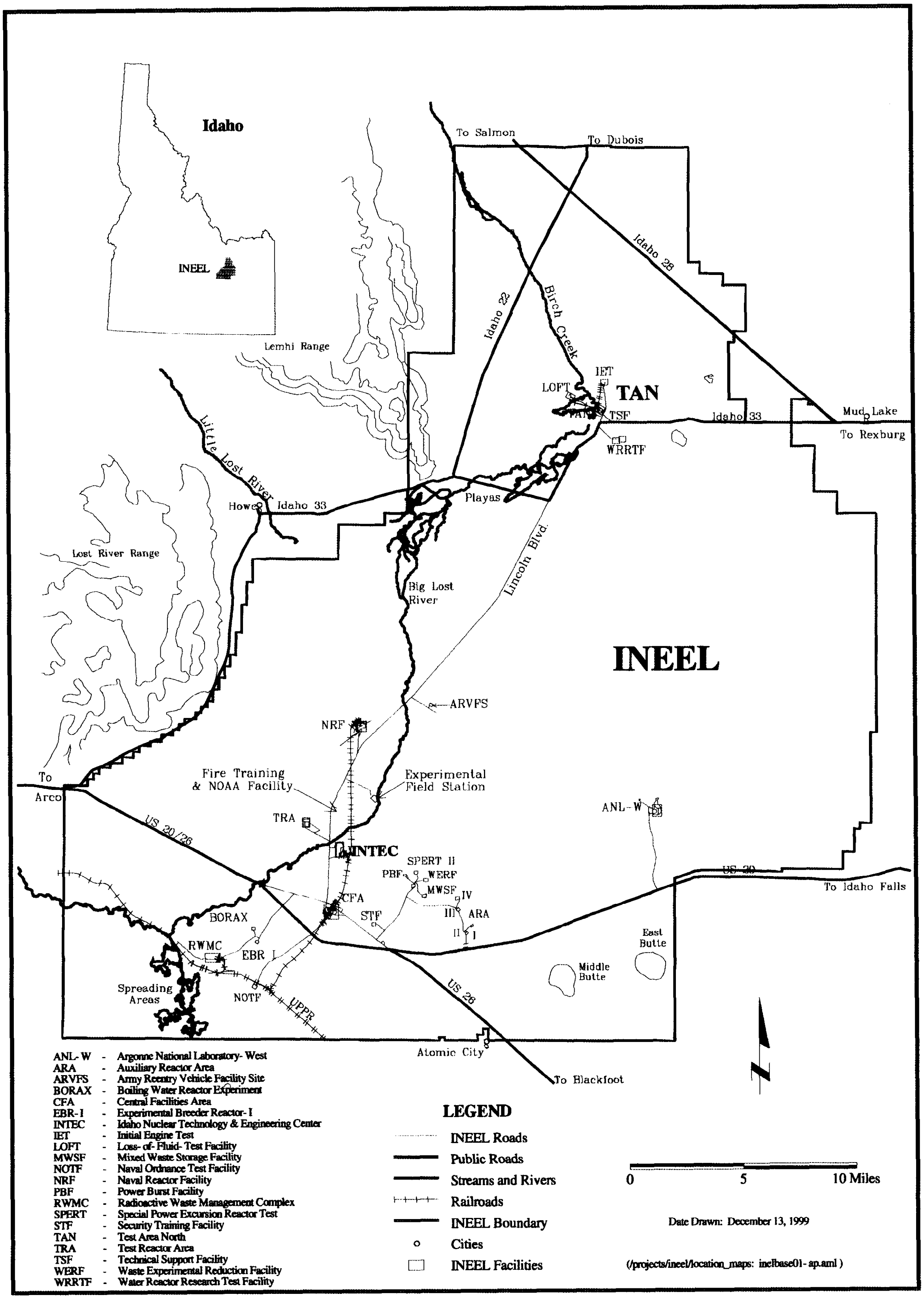

Figure 1-1. Location of Test Area North at the Idaho National Engineering and Environmental Laboratory.

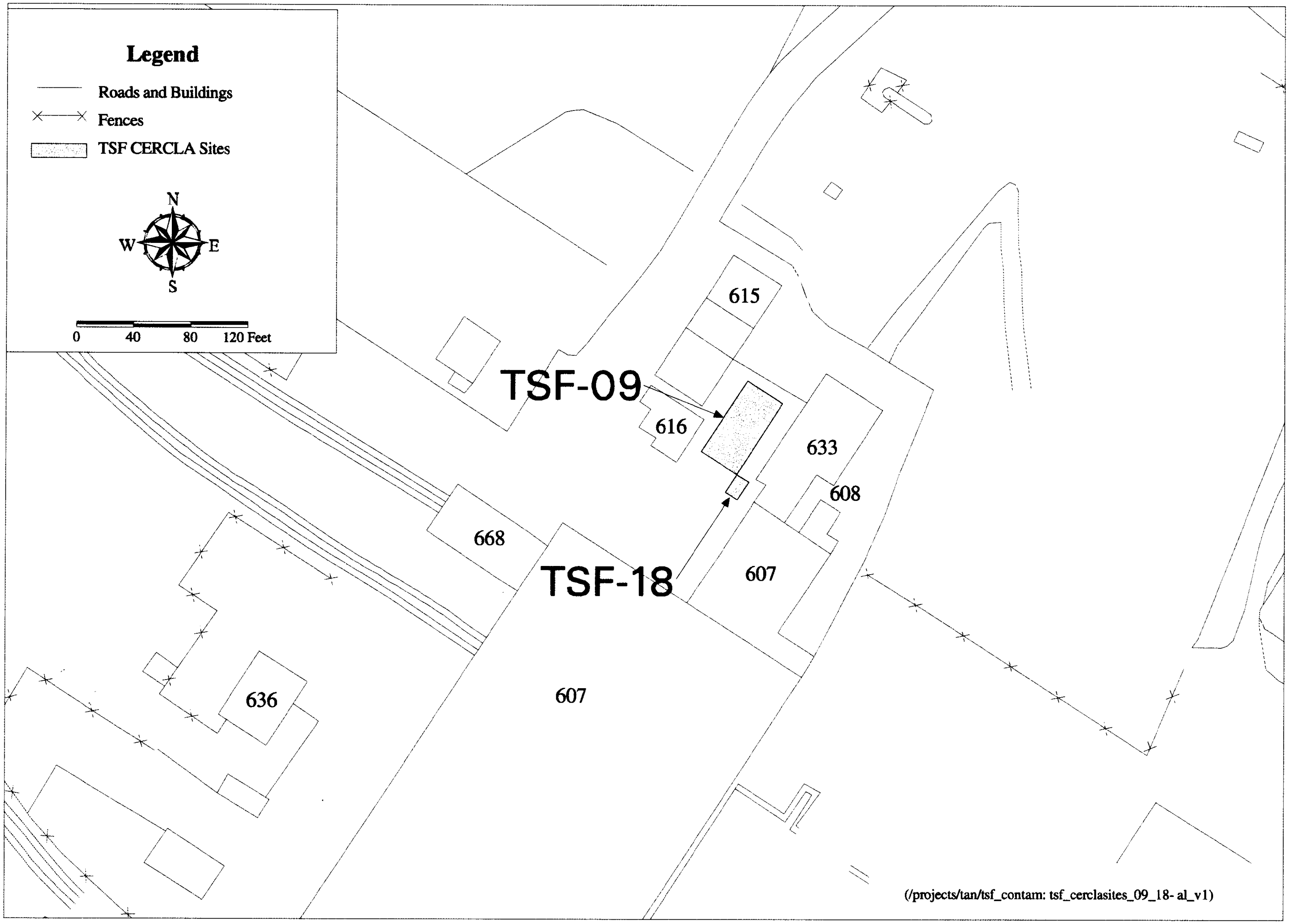

Figure 1-2. V-Tank Sites at TAN.

Waste was transferred from the TAN-616 evaporator pit sump and pump room sump, the TAN-607 laboratory drain, the TAN-607 Warm/Hot Shop drain, and TSF-21 (Valve Pit #2) through the TAN-1704 valve pit (Valve Pit #1) to TSF-18 (Tank V-9). The overflow from Tank V-9 drained to TSF-09 (Tanks V-1, V-2, and V-3) (INEEL 2001a). Figure 1-3 depicts the relationship of these units and the primary waste sources. The following sections provide brief descriptions of TSF-09, TSF-18, the contaminated soil attributable to both units, and the non-CERCLA components to be addressed under this RD/RA WP.

1.2.2.1 TSF-09, TSF Intermediate-Level (Radioactive) Waste Disposal System. The TSF-09 consists of three 37,860-L (10,000-gal) underground storage tanks (Tanks V-1, V-2, and V-3), ancillary lines, and surrounding contaminated soil. The tanks and associated piping were installed in 1953 and became operational in 1958. The tanks were designed to collect and store liquid radioactive waste at TAN. The waste was stored in the underground tanks then treated in the evaporator system located in TAN-616. Residues from the TAN-616 treatment process were sent to the PM-2A tanks at TSF-26 or the TSF injection well (condensate). In 1970, the TAN-616 evaporator system failed and all wastes were directed to the PM-2A tanks (DOE-ID 1997). After 1975, the waste was removed from the tanks through the tank vent pipes using a sump pump. The waste was pumped into tanker trucks and shipped to the Idaho Chemical Processing Plant (INEL 1994). Tanks V-1 and V-3 became inactive in the early 1980s. Tank V-2 was taken out of service in 1968 after a large quantity of oil was discovered in the tank. The oil was removed in 1981. In 1982, the free liquid was removed from the V-Tanks. Additional wastewater was reportedly added to Tank V-3 through 1985. Starting in 1985, all low-level radioactive waste at TAN was rerouted to the TAN-666 evaporator through a piping modification in the TAN-1704 valve pit. The piping modification stopped intentional discharge to the V-Tanks in 1985. There is no evidence that sludge accumulating in the tanks was removed during or after site operations (DOE-ID 1997).

Tanks V-1, V-2, and V-3 are stainless steel tanks measuring 3 m (10 ft) in diameter, 5.5 m (18 ft) long, and buried approximately 3 m (10 ft) below ground surface. The tanks have 50.8-cm (20-in.) manholes that are accessible through 1.8-m (6-ft) diameter culverts installed in 1981 (DOE-ID 1997). Each tank is equipped with three subsurface influent lines and one subsurface effluent line. The tanks received radioactive wastewater via an influent line from Tank V-9 (Figure 1-3). The remaining influent lines include a caustic line used to neutralize the waste prior to transfer to TAN-616 and a return flow line from the TAN-616 pump room. Tank V-3 has an additional inlet line from the TAN-615 east and west sumps. A single effluent line on each tank is routed to the TAN-616 pump room and evaporator system (Appendix A).

Liquid level measurements, recorded since April 1996, track the fluid levels in V-1, V-2, and V-3. Measurements since 1996, and anecdotal information preceding 1996, indicate an increase in the liquid level in Tank V-3 during the spring. All lines, valves, and drains associated with the TSF-09 tanks are either plugged or identified as inactive; therefore, the increase is believed to be from spring snowmelt and runoff entering the tank through the culvert above the entrance to Tank V-3. Liquid level measurements in Tanks V-1 and V-2 have remained relatively constant (DOE-ID 1997).

The volume of liquid and sludge in the TSF-09 tanks has been estimated based on the results of the 1996 RI/FS sampling (DOE-ID 1997). The volume of solids in Tanks V-1 and V-2 is approximately 1,965 L (520 gal), and Tank V-3 has an estimated 2,465 L (652 gal) of sludge. Estimated liquid volumes for Tanks V-1, V-2 and V-3 are 4,400 L (1,164 gal), 4,067 L (1,076 gal), and 22,000 L (5,818 gal), respectively (Blackmore 1998). From liquid level measurements, the current volume of V-3 is estimated as 31,419 L (8,300 gal), which represents 2,456 L (652 gal) of sludge and 28,951 L (7,648 gal) of liquid.

Based on the 1993 Track 2 investigation and the 1996 RI/FS sampling results, the potential contaminants of concern (COCs) for the three tanks were metals (e.g., mercury, chromium, and lead), volatile organic compounds (VOCs) (e.g., tetrachloroethene, trichloroethene, and carbon tetrachloride),

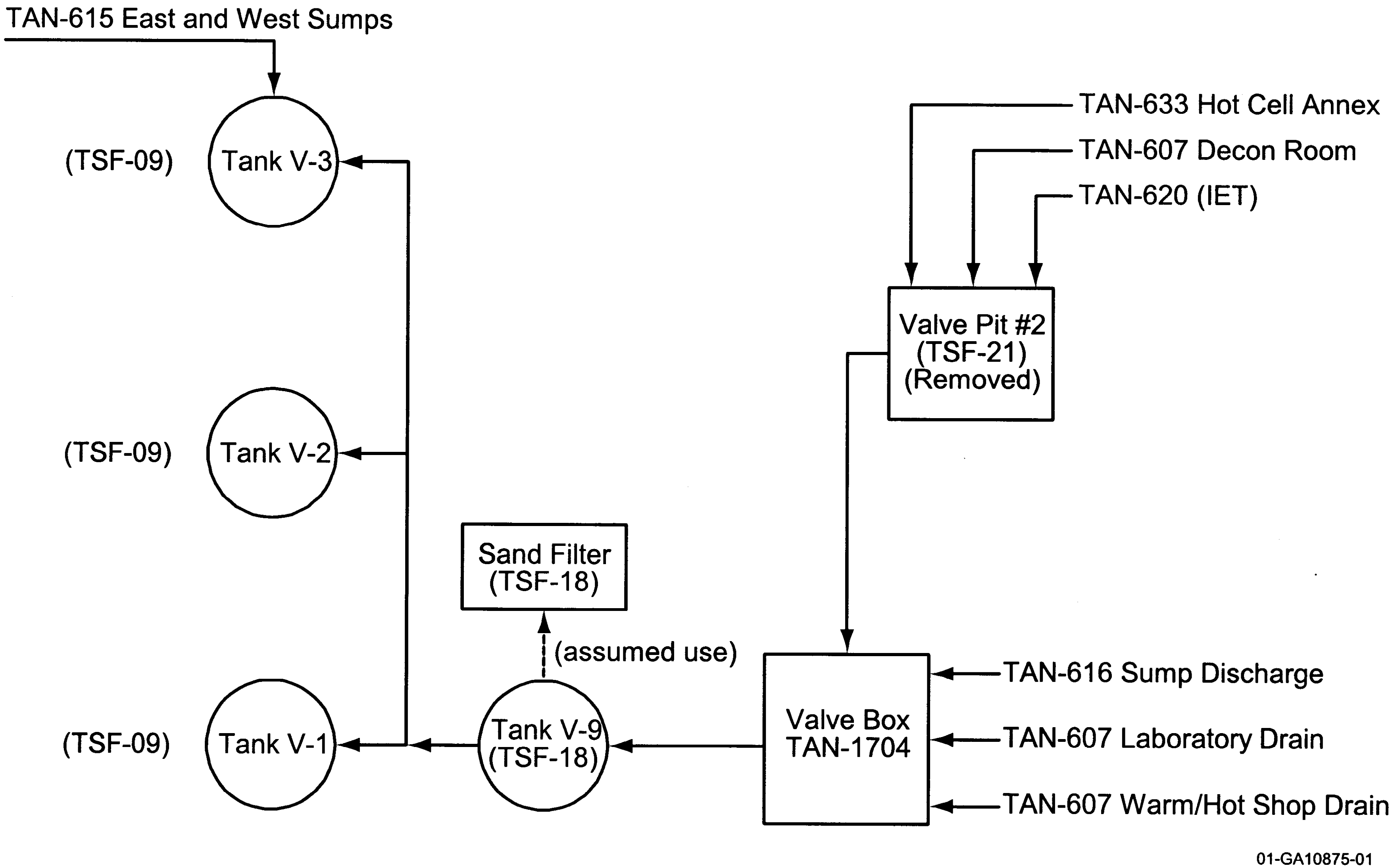

Figure 1-3. Primary waste sources and relationship among remedial sites.

semivolatile organic compounds (SVOCs) (e.g., polychlorinated biphenyls [PCBs]), and radionuclides (e.g., Cs-137, Co-60, Sr-90, and various isotopes of plutonium and uranium) (DOE-ID 1997; INEL 1994). The 1996 RI/FS sample results indicated potentially problematic levels of fissile materials in the tanks. In 1998, an evaluation of criticality issues associated with TSF-09 determined that there is not sufficient radionuclide mass in each of the V-1, V-2, and V-3 tanks to sustain a critical reaction (Blackmore 1998). Appendix H presents historical tank content characterization data.

Currently, TSF-09 is administratively controlled. The site is fenced and posted with signs that identify it as a CERCLA site. No activities can be performed at the site without contacting the INEEL Environmental Restoration directorate, and entry into the site requires radiological control precautions. The purpose of these controls is to keep worker exposures as low as reasonably achievable (ALARA) and to prevent the spread of contaminated soil (DOE-ID 1997).

1.2.2.2 **TSF-18, Contaminated Tank southeast of V-3.** TSF-18 includes a single conical-shaped sump tank (Tank V-9), V-9 tank contents, an aboveground sand filter, ancillary piping in the immediate vicinity of the tank, and surrounding contaminated soil. The abandoned underground storage tank is located in the open area between the TAN-616 and TAN-633 buildings and is adjacent to the southeast corner of TSF-09 (Figure 1-2).

Tank V-9 was installed in 1953 as part of the TAN radioactive waste collection system. The 1,514-L (400-gal) stainless steel sump tank is approximately 1.06 m (42 in.) in diameter in the center and extends approximately 2.1 m (7 ft) to the tip of the cone. The top of V-9 is approximately 2.1 m (7 ft) below ground surface (bgs) and is accessible by a 15.2-cm (6-in.) diameter riser that extends to ground surface. A baffle is located in the tank near the inlet ports. Tank V-9 has two subsurface inlet lines that received wastewater from several TAN sources via the TAN-1704 valve pit. One subsurface outlet line discharged overflow from Tank V-9 to Tanks V-1, V-2, and V-3 (Appendix A).

The 1996 RI/FS estimated that approximately 750 to 950 L (200 to 250 gal) of sludge and 265 L (70 gal) of liquid remain in the conical tank. The volume of material located behind the baffle is not known. The total volume of waste in the tank is estimated at 1,216 L (320 gal) (Blackmore 1998).

Results of the sampling and analysis of Tank V-9 conducted during the 1996 RI/FS indicate the contents of V-9 are of similar chemical nature to those of Tanks V-1, V-2, and V-3. The sample results reported high concentrations of organic compounds (e.g., trichloroethene and PCBs) and radionuclides (e.g., Cs, U, Am, Pu, and tritium). Because of the high concentration of fissile materials in the tank, a criticality evaluation was conducted in 1998. The evaluation recommended that additional sampling be conducted to adequately assess criticality issues (Blackmore 1998). Eight samples were collected from Tank V-9 in April 2001; three of those samples were collected from behind the baffle. The data evaluation resulting from that sampling effort is included as Appendix G. Appendix H presents the historical sample results of Tank V-9.

The sand filter located adjacent to the south side of the V-1 metal riser culvert is a component of TSF-18. The sand filter was apparently used to remove particulates from the Tank V-9 effluent. The filter is an aboveground concrete box containing approximately 19 L (5 gal) of material. The material in the sand filter is reported to resemble potting soil in color and texture. The concrete box has outer dimensions of approximately 1.5 m (5 ft) wide by 1 m (3 ft) deep by 1 m (3 ft) high. The concrete walls are 10 to 15 cm (4 to 6 in.) thick. The box resides on a concrete pad slightly wider than the outside dimensions. The anecdotal history of the structure indicates that it was used for only one day in 1970 before it became plugged. It has not been used since that time (DOE-ID 2000c).

The sand filter was sampled in March 1997. Results indicate the presence of PCBs and high concentrations of radionuclides (e.g., Co-60, Sr-90, Tc-99, Cs-137, U-234, and U-235) (Appendix H). Gross alpha and beta concentrations were 1.65×10^4 picocuries per gram (pCi/g) and 3.73×10^5 pCi/g, respectively (DOE-ID 2000c). A criticality evaluation performed on the sand filter contents determined that there is not sufficient U-235 present to pose a criticality concern (DOE-ID 2000c).

TSF-18 is administratively controlled. The site is included in the posted fenced area surrounding TSF-09. No activities can be performed at the site without contacting the INEEL Environmental Restoration directorate, and entry into the sites requires radiological control precautions (DOE-ID 1997).

1.2.2.3 Contaminated Soil. The AOC for the Group 2 sites is defined by the contaminated soil associated with TSF-09 and TSF-18 operations (Figure 1-4) (DOE-ID 1999). The surface and subsurface contaminated soil resulted from spills that occurred when waste was transferred to and from the tanks during the waste disposal system operations. Additional contamination may have originated from runoff from the adjacent cask storage pad. Anecdotal information indicates that disposal of weed control chemicals may also have contaminated the area (INEL 1994).

A specific pumping event in 1982 accidentally released approximately 6,435 L (1,700 gal) of tank liquids onto the ground surface. The leaked liquid accumulated in a depression along the west side of the tanks and flowed north out of the controlled radiological area through a shallow ditch (Figure 1-4). Cleanup operations removed approximately 3.8 m^3 (128 ft^3) of radioactive soil in a 0.9-m^2 (10-ft^2) area north of the tanks and outside the posted radiological control zone, and the excavation was backfilled with clean soil (INEL 1994).

Four soil sampling events have been conducted at TSF-09 and TSF-18. Appendix H presents tabulated analytical results and maps of sample locations. During 1980 and 1983, soil samples collected as part of a decontamination and decommissioning project confirmed that high concentrations of radionuclides were present in the shallow soils surrounding the V-Tanks (INEL 1994). In July 1988, the DOE conducted an environmental survey of the INEEL. The survey collected soil at TSF-09 from three boreholes advanced to a depth of 0.3 to 0.6 m (1 to 2 ft). Samples were analyzed for VOCs, SVOCs, metals, and beta/gamma activity. Analytical results for the VOC and SVOC analyses were nondetect. Total metals analysis reported slightly elevated levels of mercury and beryllium (INEL 1994). During the 1993 Track 2 investigation for TSF-09 and TSF-18, three boreholes were advanced to depths from 2.5 to 7.3 m (8 to 24 ft). Samples were analyzed for radionuclides and organic and inorganic constituents. Based on the results of the investigation, the soil is contaminated with radionuclides (e.g., elevated levels of beta activity, Cs-137, Co-60, and Sr-90) and low concentrations of organic constituents (e.g., trichloroethene and PCBs) (INEL 1994). Additional sampling was conducted in 1998 to provide specific data to support waste classification of the soil. Twelve samples were collected from four boreholes. Three boreholes were drilled to a depth of 3 m (10 ft), and the fourth location was advanced to a depth of 6 m (20 ft). Soil samples were analyzed for PCBs, VOCs, and toxicity characteristic leaching procedure (TCLP) metals (DOE-ID 1998). Analytical results were generally not detected and below the RCRA-regulated TCLP and land disposal restriction (LDR) concentrations (Hain 1998).

The soil sampling efforts provide data regarding the nature of the contaminants; however, the horizontal and vertical extent of soil contamination is not fully identified. The extent is conservatively estimated based on sampling, radiation surveys, and geologic features. The horizontal extent is estimated to encompass an area of 15.2 by 24.4 m (50 by 80 ft). Vertical extent of contamination is known to extend to a depth of 6.7 m (22 ft) (DOE-ID 1997).

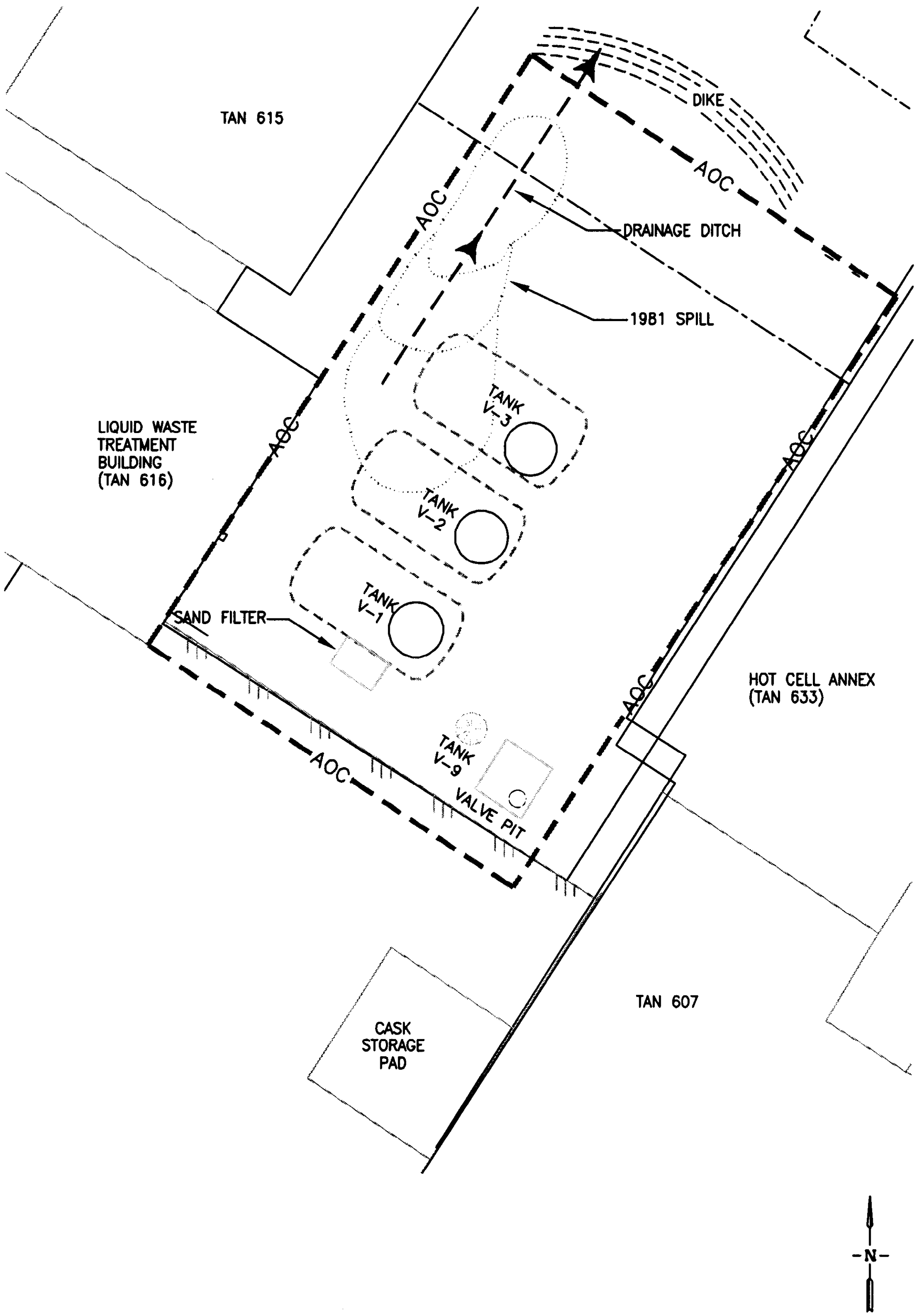

Figure 1-4. Area of contamination and site structures.

Although a recommendation was made in the early 1980s to remove all radioactively contaminated soil from the sites, there are no indications that the removal was conducted. Additional soil has been added to the area over the past 20 years as a cover to contain the radioactivity and reduce the potential for offsite migration. Contaminated soil may be buried 0.3 to 0.6 m (1 to 2 ft) below current ground surface. Previously, surface water flowed from the TSF-09 site into a drainage ditch flowing north from the site. The drainage ditch was blocked in 1981 following an accidental release from the pumping operations.

1.2.2.4 **Non-CERCLA Components.** Several non-CERCLA components of the intermediate-level waste disposal system are located within the boundary of the AOC. As shown in the remedial design drawings (Appendix A, Sheet 7 of 20, Pipe Removal Plan), the TAN-1704 valve pit, a segment of the associated influent lines, and additional piping that may impede access to the Group 2 sites will be removed under this CERCLA RD/RA WP, but will be managed in accordance with the RCRA VCO. Removal of VCO components will be funded from the INEEL VCO program.

The TAN-1704 valve pit was installed in 1953 to receive wastewater from the original TSF facilities. The unit became inactive in the late 1980s. The valve pit contains piping and valves that transferred low-level radioactive wastewater from the TSF facilities to Tank V-9, and later to TAN-666. The valve pit received wastewater from four influent lines. These lines were from the TAN-616 evaporator pit sump and pump room sump, TAN-607 laboratory drain, TAN-607 Warm/Hot Shop, and TSF-21 Valve Pit #2 (Figure 1-3). The lines from TAN-616 were cut and capped within the valve pit in 1991. The TAN-607 lines have remained open. However, the valves are closed at the valve pit, and material may have backed up in the lines. Two effluent lines from the TAN-1704 valve pit drained to Tank V-9 (TSF-18). These lines were cut and rerouted to TAN-666, while the two pipes to V-9 were capped within the valve pit in 1991. Outside the valve pit, the effluent lines are designated as part of the CERCLA-managed TSF-18 (INEEL 2001a).

The internal dimensions of the concrete valve pit are 1.5 m (5 ft) by 1.6 m (5.3 ft) by 2.9 m (9.5 ft) in depth. Access to the valves is via a manhole. The calculated internal volume of the valve pit is 7,170 L (1,895 gal). Approximately 0.3 m (1 ft) of liquid (approximately 760 L [200 gal]) was noted in the base of the valve pit during the 2000/2001 Decontamination and Dismantlement/VCO characterization effort. The liquid was presumed to be from precipitation. A liquid sample was collected and analyzed for total VOCs, TCLP VOCs, TCLP inorganics, TCLP SVOCs, PCBs, and radionuclides. With the exception of estimated trace values reported for trichloroethene and 2-hexanone, the sample results indicate that the liquid contains only radionuclides (Ce-144, Cs-137, Co-60, Sr-90, and gross beta activity) (INEEL 2001b).

1.3 Selected Remedy Implementation Approach

The Agencies have selected the remedy for the OU 1-10 V-Tank site addressed in this RD/RA WP based on CERCLA requirements, the detailed analysis of alternatives, and public comments. The remedy, as selected in the 1999 ROD and augmented by the 2001 ESD, is soil and tank removal, ex situ treatment of tank contents, and disposal of the tanks, tank contents, and ancillary piping and equipment.

This section describes the general approach to be implemented for the remedial action of the V-Tanks. Details of the remedial action implementation are located in Section 6.

The major components of the selected remedy for the V-Tanks include:

- Removal of tank contents, which includes separation of liquid and sludge phases
- Onsite treatment of liquid

- Storage of sludge onsite pending shipment to an offsite Treatment, Storage, and Disposal Facility (TSDF)
- Excavation and removal of the tanks, piping, and ancillary equipment
- Characterization of removed material for waste disposal
- Disposal of the removed structures and contents
- Disposal of contaminated soil excavated to remove the tanks
- Disposal of some waste streams to an onsite repository
- Confirmatory soil sampling at the base of the tank excavations
- Backfilling the tank excavation with clean soil, pending confirmatory sampling results
- Further characterization of horizontal and vertical extent of soil contamination in the area surrounding TSF-09 and TSF-18 and migration pathways
- Additional excavation of contaminated soil as identified by the characterization effort until the remediation goals have been met
- Confirmatory sampling at the base of excavations
- Disposal of contaminated soil
- Backfilling the excavated areas with clean soil, contouring and grading the area to provide appropriate site drainage
- At the completion of the remedial action, revised institutional controls consisting of signs, access control, and land use restrictions may be established and maintained, depending on the results of the confirmatory sampling.

1.4 Pre-Remedial Action Sampling (V-9 Criticality Evaluation)

In 1998, an evaluation of the criticality issues associated with Tank V-9 was performed. The evaluation was not conclusive in determining if the mass of fissile material was sufficient for a criticality event. Additional sampling was recommended. Based on that recommendation, eight samples were collected from Tank V-9 in April and May 2001 prior to remediation activities. Three samples were collected from behind the baffle along the inlet side of the tanks, two along the tank centerline, and three along the outlet side of the tank. Samples were analyzed for U isotopes, moisture content, bulk density, and TCLP metals (DOE-ID 2000c).

A report of the Tank V-9 sample results and analysis was prepared and is included as Appendix G.

A statistical evaluation was performed using the 2001 sample results to evaluate the concentration of U-235 and U-238 in each zone of the tank. The statistical analysis determined an upper bound of the mass of fissile material in each zone and estimated the total mass of U-235 and U-238 in the tank, using a 99% upper confidence limit (EDF-ER-325).The statistical analysis calculated less than one kilogram of

U-235 in Tank V-9. Following the statistical analysis, an evaluation of potential criticality safety issues was performed. The criticality analysis determined that several hundred kilograms of uranium would be the required minimum critical mass under the current configuration of Tank V-9. The criticality analysis concluded that there are no criticality safety issues associated with Tank V-9. Furthermore, an evaluation of the planned Tank V-9 contents removal and storage approach, presented in this RD/RA WP, was performed. The remedial action for Tank V-9 was determined to not pose a criticality concern (Nielsen 2001).